Draft Decision

Transgrid Transmission Determination 2023 to 2028

(1 July 2023 to 30 June 2028)

Attachment 10
Service target performance incentive scheme

September 2022

AUSTRALIAN ENERGY REGULATOR

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Note

This attachment forms part of the AER's draft decision on Transgrid's 2023–28 transmission determination. It should be read with all other parts of the draft decision.

The draft decision includes the following documents:

Overview

Attachment 1 – Maximum allowed revenue

Attachment 2 – Regulatory asset base

Attachment 3 – Rate of return

Attachment 4 – Regulatory depreciation

Attachment 5 – Capital expenditure

Attachment 6 – Operating expenditure

Attachment 7 – Corporate income tax

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10 Service target performance incentive scheme

The service target performance incentive scheme (STPIS) provides a financial incentive to transmission network services providers (TNSPs) to maintain and improve service performance. The current version of the STPIS, version 5, will apply to Transgrid, including the three standard components of the STPIS—the service component (SC), the market impact component (MIC) and the network capability component (NCC).

The SC provides a reward/penalty of +/-1.25% of maximum allowed revenue (MAR) to improve network reliability, by focussing on unplanned outages. The SC is designed to encourage TNSPs to seek to reduce the number of unplanned network outages and to promptly restore the network in the event of unplanned outages that result in supply interruptions. This component is also designed to indicate potential reliability issues.[1]

The MIC provides an incentive to TNSPs to minimise the impact of transmission outages that can affect wholesale market outcomes. Under the MIC, TNSPs receive a reward/penalty of up to +/-1% of MAR for the relevant calendar year. The MIC measures performance against the market impact parameter which is the number of dispatch intervals where an outage on the TNSP's network results in a network outage constraint with a marginal value greater than $10/MWh (MIC count).[2]

Each TNSP's annual MIC count is measured against its target, where the target is calculated by averaging the median 5 of the last 7 years' performance. Further, the dollars per dispatch interval ($/DI) associated with the reward/penalty for each count can be directly calculated for the regulatory control period from the MIC target, and the MAR. Both the target and the $/DI are fixed for the regulatory control period.[3]

The NCC is designed to encourage TNSPs to develop projects (up to a total of 1% of the proposed MAR per year) in return for a pro-rata incentive payment of up to 1.5% of MAR depending on the successful completion of proposed projects. This component encourages TNSPs to examine their networks to identify suitable low cost one-off operational and capital expenditure projects that improve the capability of the transmission network at times when it is most needed.

10.1 Draft decision

We will apply the version 5 of the STPIS (the scheme) to Transgrid for the 2023–28 regulatory control period (2023–28 period). Our draft decision outlined below is based on Transgrid's historical performance data including the 2021 calendar year.[4]

1 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 2.2(a)(1–3).

2 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, Appendix C

3 The target will be calculated from the average of the 5 values remaining from the last 7 years of data excluding the largest and smallest annual values.

4 Under STPIS, performance targets calculations must be based on performance history data up to the year ending immediately prior to the submission of the revenue proposal (2021).

Table 10.1 Draft decision — Service Components caps floors and target for 2023–28

Parameter	Floor	Target	Cap
Unplanned outage circuit event rate %			
Transmission line - fault	21.84	14.29	8.80
Transformer - fault	14.98	9.66	5.87
Reactive plant - fault	18.72	12.14	6.81
Transmission line - forced	15.24	8.68	3.76
Transformer - forced	17.45	9.87	5.05
Reactive plant - forced	13.68	9.82	6.88
Loss of supply events frequency			
No. of events > 0.05 system minutes	3	1	0
No. of events > 0.25 system minutes	1	0	0
Average outage duration			
Average outage duration	87	56	35
Proper operation of equipment			
Failure of protection system	19	13	7
Material failure of SCADA	0	0	0
Incorrect operational isolation of primary or secondary equipment	9	5	2

Source: AER Analysis

Table 10.2 Draft decision — Market Impact Component parameter values for 2023–28

Parameter	
Target	6476
Unplanned outage event limit	1101
Dollar per dispatch interval	1385

Source: AER Analysis

Table 10.3 Draft decision — Network Capability Component for 2023–28

Priority project name	Proposed capex ($ million)	Proposed opex ($ million)	Amount approved ($ million)
1. Increase capacity for Generation between Darlington Point and Wagga	0.0	0.0	0.0
2. Darlington Point 330/220 kV transformer tripping scheme	0.4	0.0*	0.4
3. Increase capacity for generation X5 voltage stability constraints	5.5	0.1	5.6
4. 94T line dynamic ratings.	0.4	0.0*	0.4
5. Yass 330/132 kV transformer dynamic ratings	0.0	0.0	0.0
6. Maintain capacity during Climate Change – install dynamic line ratings on multiple lines	5.9		5.9
Total	**12.2**	**0.1**	**12.3**

Source: AER Analysis, AEMO review of Transgrid Network Capability Incentive Parameter Action Plan (NCIPAP) for 1 July 2023 to 30 June 2028 (endorsement letter)
Note: Values rounded up to millions

10.2 Transgrid's proposal

Transgrid's revenue proposal sought to apply version 5 of the STPIS as follows:

- The SC parameter targets are set equal to average historic performance and the caps and floors are set at the 5th and 95th percentiles of historic performance.[5]

  With respect to the SC, Transgrid proposed an alternative parameter by altering the Loss of Supply (LoS) events >0.25 (y) system minutes to >0.15 (y) system minutes. Transgrid stated that its strong performance for the LoS events >0.25 (y) system minutes parameter will result in a target and cap of zero for the 2023–28 period. Transgrid outlined that setting both the target and cap to zero is contrary to the intent of the scheme and NER to incentivise TNSPs to maintain or improve performance.[6]

- The MIC performance data from 2016–20 is included to enable calculation of the parameter values set out in clause 4.2(b)(1)–(3), being the annual performance target, the unplanned outage event limit and the dollar per dispatch interval incentive.[7]

- The Network Capability Incentive Parameter Action Plan (NCIPAP) proposes 6 priority projects to improve network capability. The total proposed cost of the NCIPAP is approximately $16.2 million, which may lead to an incentive reward up to 50% of the cost. This would amount to around $24.3 million over the 2023–28 period if the relevant conditions are met.[8]

5 Transgrid, *Revenue Proposal 2023-28*, 31 January 2022, p. 151.
6 Transgrid, *Revenue Proposal 2023–28*, 31 January 2022, p. 152.
7 Transgrid, *Revenue Proposal 2023-28*, 31 January 2022, p. 153.
8 Transgrid, *Revenue Proposal 2023-28*, 31 January 2022, p. 154.

10.3 Assessment approach

A revenue determination for a TNSP is to specify, amongst other things, the annual building block revenue requirement for each regulatory year of the regulatory control period. In turn, the annual building block revenue requirement must be determined using a building block approach, under which, one of the building blocks is the revenue increments or decrements (if any) for that year arising from the application of any STPIS (and other schemes). We have assessed Transgrid's revenue proposal against the requirements of STPIS version 5.

10.3.1 Service component

We assessed whether Transgrid's proposed performance targets, caps and floors comply with the STPIS requirements for:

- average circuit outage rate, with 6 sub parameters[9]
- loss of supply event frequency, with two loss of supply event sub-parameters[10]
- average outage duration[11]
- proper operation of equipment, with 3 sub-parameters.[12]

Under the STPIS, we must accept Transgrid's proposed parameter values if they comply with the requirements of clause 3.2 of STPIS. We may reject them if they are inconsistent with the objectives of the STPIS.[13] We measure actual performance for the 'average circuit outage rate' and 'average outage duration' parameters on a two-calendar year rolling average in accordance with Appendix E of the STPIS.

We assessed Transgrid's SC proposal against the requirements of the STPIS–that is, whether:[14]

- Transgrid's data recording systems and processes produce accurate and reliable data and whether the data is recorded consistently based on the parameter definitions under the STPIS
- the proposed performance targets were equal to the average of the most recent 5 years of performance data
- any adjustments to the proposed targets are warranted and reasonable
- Transgrid applied a sound methodology, with reference to the performance targets, to calculate the proposed caps and floors
- any adjustment to a performance target was applied to the cap and floor of that parameter.

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9 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, Appendix A, p. 26.

10 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, Appendix A, p. 26

11 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, Appendix A, p. 30.

12 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, Appendix A, p. 32.

13 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 3.2.

14 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 3.2.

We also assessed the probability distributions applied by Transgrid to calculate caps and floors to determine whether a sound methodology was used.

10.3.2 Market impact component

We assessed Transgrid's MIC proposal against the requirements of the STPIS–that is, whether:

- data used to calculate the market impact parameter is accurate and reliable, and consistently recorded based on the parameter definition in Appendix C[15]
- the proposed performance target was calculated in accordance with the requirements of clause 4.2(g) in version 5 of the STPIS
- the proposed unplanned outage event limit has been calculated in accordance with the requirements of clause 4.2(h) in version 5 of the STPIS
- the proposed dollar per dispatch interval has been calculated in accordance with clause 4.2(j) in version 5 of the STPIS.

Where Transgrid's proposed values for the market impact parameter do not comply with the requirements of the STPIS or is otherwise inconsistent with the objectives of the scheme[16], we will reject the proposed values and provide substitute values which comply with the STPIS.

10.3.3 Network Capability Component

We assessed Transgrid's NCC against the STPIS requirements to take into account:[17]

- the likely effect of the priority project improvement on wholesale market outcomes, including inter-regional outcomes
- the likely effect of the priority project improvement in ensuring that the transmission network can meet demand at an injection point without major network augmentation or replacement
- whether the priority project improvement is appropriate, taking into account the forecast changes in demand at a relevant injection point
- the benefits to consumers resulting from the priority project improvement
- the extent to which a TNSP would be incentivised or required to undertake such a project under the NER or any other applicable regulatory obligations
- the time taken for a project to have a net positive benefit
- any relevant information contained in the TNSP's most recent annual planning report 8
- whether the average total expenditure of all the TNSP's priority projects in each regulatory year is not greater than 1% of the TNSP's annual average MAR.[18]

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15 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, clause 4.2(c).

16 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl 4.2(d).

17 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 5.2(l).

18 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 5.2(b)(vi).

10.4 Interrelationships

The STPIS considers any other provisions in the NER that incentivise TNSPs to minimise capital expenditure (capex) or operating expenditure (opex). One of the objectives of the STPIS is to assist in the setting of efficient capital and operating expenditure allowances by balancing the incentive to reduce actual expenditure with the need to maintain and improve reliability for customers and reduce the market impact of transmission congestion.

The STPIS will interact with the capital expenditure sharing scheme (CESS) and the opex efficiency benefit sharing scheme (EBSS). The STPIS allows us to adjust the performance targets of the SC for the expected effects on the TNSP's performance from any increases or decreases in the volume of capital works planned during the regulatory control period.[19] In conjunction with the CESS and the EBSS, the STPIS will ensure that:

- any additional investments to improve service quality are based on prudent economic decisions
- reductions in capex and opex are achieved efficiently, rather than at the expense of service levels to the network users.

10.5 Submissions

With respect to Transgrid's proposed alternative methodology for calculating the large LOS, the Consumer Challenge Panel (CCP25) stated:[20]

> 'We note the similarities between Transgrid's Revenue Proposal and that of Powerlink in January 2021 and note the AER's response. We agree with the reasoning from CCP23 regarding the calculation of the service component (SC) and the risk of consumers paying twice. For these reasons, we do not support the alternative methodology.'

10.6 Reasons for draft decision

We calculated Transgrid's performance target values using the 5-year performance data available to us during the 2017–21 period.

We will apply version 5 of the STPIS with the AusNet Services MIC exclusions clarification. The reasons for our draft decision are outlined below.

10.6.1 Service component

Changing the Loss of Supply parameter

In its revenue proposal, Transgrid sets out its methodology for choosing the distribution and target, cap, and floor results for the SC sub-parameters. By applying the 5-year average over the 2017–21 period as per clause 3.2(f) of the Scheme, Transgrid will yield a zero target for the large LoS events >0.25 (y) system minutes parameter.[21]

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19 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl. 3.2(j)(2).

20 CCP25, *Advice to the AER on the 2023 – 28 Electricity Transmission Regulatory Revenue Proposal*, 11 May 2022, p.19.

21 Transgrid, *Revenue Proposal 2023–28*, 31 January, p. 152.

As stated in section 10.2, Transgrid submitted that a zero target does not support the intent and design principles of the Scheme. Consequently, Transgrid proposed an alternative calculation method, whereby the LoS (variance) parameter is altered to >0.15 (y) system minutes from the current STPIS default parameter value of >0.25 (y) system minutes. This will yield a target of 1 for the LOS events >0.25 (y) system minutes for the 2023–28 period.[22]

Under clause 3.2(i) we may approve an alternative methodology for calculating the performance target as submitted by a TNSP provided that we are satisfied that the 5 requirements specified in the Scheme at cl.3.2(i) are met.

Transgrid submitted that its proposed alternative calculation method met all the requirements of clause 3.2(i) of the Scheme.[23].

We have assessed Transgrid's proposal and are not satisfied that the alternative methodology is consistent with the objectives in clause 1.4 of the Scheme, for the purposes of clause 3.2(i)(5) of the Scheme.

The first of these objectives is that the Scheme contributes to the achievement of the National Electricity Objective (NEO)—to promote efficient investment in, and efficient operation and use of, electricity services for the long-term interests of consumers of electricity with respect to—

(a) price, quality, safety, reliability, and security of supply of electricity; and

(b) the reliability, safety, and security of the national electricity system.

We are not satisfied that Transgrid's proposed alternative method for the LoS contributes to the achievement of the NEO by promoting efficient investment in, and efficient operation and use of, electricity services for in the long-term interest of consumers. We consider Transgrid has not adequately outlined or consulted with consumers:

- on the costs of its proposed methodology and the benefits that consumers are expected to receive by changing the status quo
- quantitatively detailed how or what investments it intends to undertake to improve reliability and or how these projects will improve reliability and benefit consumers.

In assessing Transgrid's performance, we found Transgrid's LoS performance to be very low, showing that the system is reliable and it is likely to be at the efficiency frontier. We consider that providing a STPIS incentive to further reduce the variance in the LoS event metric (from> 0.25 (y) to 0.15 (y) system minutes) may not produce a net benefit to consumers. This is because once the network reaches a mean LoS performance of zero there are unlikely to be any real investment opportunities that could improve that performance any further. As such, any STPIS reward is a payment by the consumer for which no benefit can be realised – such payments are not in the long-term interests of consumers. Further, it is important that the scheme operates symmetrically through time, otherwise consumers may be required to pay for reliability improvements twice.

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22 Transgrid, *Revenue Proposal 2023–28*, 31 January, p. 152.

23 Transgrid, *Revenue Proposal 2023–28*, 31 January, p. 152.

For these reasons, we do not approve Transgrid's submission to change the LoS event >0.25 (y) system minutes parameter. We have therefore applied the Scheme methodology to calculate the LoS target.

Performance targets

We do not accept Transgrid's calculated performance data because:

- it is not based on the latest available historical data for 2017–21, and
- Transgrid's proposal to alter the LoS parameter is not in the long term interest of consumers.

We have thus calculated Transgrid's SC targets using 2017–21 performance data. The results are outlined in Table 10.1.[24]

Caps and floors

Proposed caps and floors must be calculated with reference to the proposed performance targets using a sound methodology. In arriving at our draft decision, we calculated Transgrid's cap and floor values using our @risk model (Table 10.4).[25] Our approach used 5 years of performance data to determine a statistical distribution that best fits that data—with the caps and floors set at 2 standard deviations either side of the mean (using a normal distribution); or at the 5th and 95th percentiles (if using a distribution other than the normal distribution).

Table 10.4 Draft decision — Distribution, Floors and Caps for 2023–28

Parameter	Distribution	Floor (95th percentile)	Cap (5th percentile)
Unplanned outage circuit event rate			
Transmission line - fault	LogLogistic	21.84	8.80
Transformer - fault	LogLogistic	14.98	5.87
Reactive plant - fault	Gamma	18.72	6.81
Transmission line - forced	Gamma	15.24	3.76
Transformer - forced	Pearson5	17.45	5.05
Reactive plant - forced	Pearson5	13.68	6.88
Loss of supply events frequency			
No. of events > 0.05 system minutes	Poisson	3	0
No. of events > 0.25 system minutes	Poisson	1	0
Average outage duration			
Average outage duration	Pearson5	87	35
Proper operation of equipment			
Failure of protection system	Poisson	19	7
Material failure of SCADA		0	0

24 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, cl 3.2(f).

25 Our @risk model has been used to set the cap and floor range in most of our recent determinations.

Incorrect operational isolation of primary or secondary equipment	Poisson	9	2

10.6.2 Market Impact Component

Performance targets

The performance target is calculated in accordance with clause 4.2(f) of version 5 of the STPIS.

We do not accept Transgrid's calculated performance data because it is not based on the latest available historical data for 2015–21.

Based on its historical data for the period 2015 to 2020, Transgrid has proposed a performance target of 3344 dispatch intervals.[26]

Transgrid's revenue proposal stated that the energy transition has resulted in widespread congestion across its network which did not previously exist in its historical performance. Consequently, Transgrid's revenue proposal also submitted that the application of the MIC needs a review to develop an alternative method for calculating the MIC.[27]

Our draft decision is to apply the version 5 of the STPIS to Transgrid for the 2023–28 period, but with clarifications. This STPIS clarification applies to semi-dispatch renewable energy generators. This was outlined in AusNet Services' revenue determination for 2022–27 (AusNet 2022–27).[28]

Our AusNet 2022–27 final decision was published in January 2022, just prior to when Transgrid submitted its proposal.

In AusNet's final decision, we considered the impact that changes in the energy mix have had on the way semi-dispatch generators bid into the market. We recognised the potential for generator bidding behaviour of semi-scheduled generators to appear as a constraint when this is outside a TNSP's control. In such cases, we considered these constraints should be excluded from MIC performance.[29]

In its response to an AER information request asking how the AusNet clarification could apply to Transgrid, it submitted 2 constraint IDs that it considered as a match for exclusions under the AusNet STPIS clarification. These 2 exclusions however related to outages for a scheduled generator and a non-scheduled generator, not semi-scheduled generators as intended by the AusNet clarification.

Transgrid submitted that, TNSPs also cannot control or have influence on dispatch generators offering their maximum potential capacity even though they know that a planned network outage is in place. Therefore, in such situations, Transgrid sought further clarification

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26 Transgrid, *Revenue Proposal 2023–28*, 31 January 2022, p. 153.

27 Transgrid, *Revenue Proposal 2023–28*, 31 January 2022, p. 153.

28 AER, *AusNet Services transmission determination, final decision, 2022–27, Attachment 10 – Service target performance incentive scheme*, January 2022, pp. 12–16.

29 AER, *Final Decision, AusNet Services Transmission Determination 2022 to 2027, Attachment 10 – Service target performance incentive scheme*, January 2022, pp. 12-19.

from us on whether these events would also meet the force majeure criteria and should be excluded from the MIC count.

We acknowledge Transgrid's submission but consider that the current exclusions clarification is specifically targeted at semi scheduled generators. As such, our draft decision is not to accept Transgrid's proposal to extend the clarification to scheduled and non-scheduled generators at this time.

10.6.3 Network capability component

The NCC is designed to drive TNSP operation and management of its network assets to develop low-cost one-off projects that deliver value for money for consumers and that are not otherwise incentivised through the regulatory framework

Our draft decision regarding Transgrid's NCIPAP are at Table 10.3, while our reasons for accepting or rejecting priority projects are outlined below.

The average total expenditure of the priority projects outlined in each regulatory year is not greater than 1% of Transgrid's average annual maximum allowed revenue as required by clause 5.2(b)(vi) of the STPIS. These projects were also endorsed by the Australian Energy Market Operator (AEMO) in its role of reviewing Transgrid's NCIPAP.[30]

Priority projects

Clause 5.2 (h) of the scheme requires TNPSs to consult with AEMO prior to submitting priority project proposals under the NCIPAP to the AER. AEMO assesses project need, improvement targets, likely material benefits, and ranking of the projects. [31]

Priority Project 1: N2176 - Uprating Darlington Point 330-132kV Transformers

We do not accept this project because it is unlikely to deliver a material benefit to consumers as required by the STPIS.[32]

This project involves the installation of additional cooling radiators to the transformers, resulting in an increase in firm capacity from 280MVA to 375MVA. Transgrid stated that additional generation has increased the loading on the Darlington Point 330/132kV transformers, such that for loss of one Darlington Point 330/132/11kV transformer the other will be 10-25% overloaded with all other elements and committed generators in-service.[33]

The estimated cost for this project is $4.2 million and the works are to provide additional firm capacity for renewable generation into the grid, potentially providing market benefits.[34]

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30 AEMO, *AEMO review of Transgrid Network Capability Incentive Parameter Action Plan (NCIPAP) for 1 July 2023 to 30 June 2028 (endorsement letter)*, 6 Dec 2021.

31 AEMO, *AEMO review of Transgrid Network Capability Incentive Parameter Action Plan (NCIPAP) for 1 July 2023 to 30 June 2028 (endorsement letter)*, 6 Dec 2021, p.2.

32 AER, *Final – Service Target Performance Incentive Scheme,* October 2015, clause 5.2 (c).

33 Transgrid, O*ptions Evaluation Report, Uprating Darlington Point 330-132kV Transformers*, 28 September 2021, p.2.

34 Transgrid, *Options Evaluation Report, Uprating Darlington Point 330-132kV Transformers*, 28 September 2021, p.2.

We consider that this project is not efficient and that Transgrid's calculated benefits are overstated because:

- The maximum benefit that can be obtained from this work (as compared to the base) under N-1 conditions (i.e., the loss of one of the transformers) is 95MVA.
- There are 2 situations considered:
  - unplanned outage due to the total loss of 1 of the transformers requiring an outage of 30 days but with a (conservative) probability of 1 in 10 years; and
  - planned outage of each transformer for 1 day each per year
- Unplanned outage:
  - Maximum additional capacity compared to base case: 95MVA
  - Utilisation of additional capacity (noting that the majority of the load is solar generation): 7 hours per day for 30 days
  - Value: $32.05/MWh
  - Probability of occurrence: 1 in 10 years
  - Total Annual Value: $64k
- Planned Outage
  - Maximum additional capacity compared to base case: 95MVA
  - Utilisation of additional capacity (noting that the majority of the load is solar generation): 7 hours per day for 1 day for each transformer
  - Value: $32.05/MWh
  - Probability of occurrence: each year
  - Total Annual Value: $43k
- Total Annual Value: $107k.

Based on a life of 13 years and a weighted average cost of capital (WACC) of 4.8%, this equates to a maximum capital spend of $856k, below the proposed capex of $4.1 million.

Priority Project 2: N2631 - Darlington Point 330/220 kV Transfer Tripping Scheme

We accept this project because it is likely to deliver a material benefit to consumers as required by the STPIS.[35]

The 220 kV network supplying Far West NSW is supplied from Darlington Point 330/220/33 kV Substation through Line X5 from Darlington Point to Balranald Substation. Darlington Point Substation is equipped with 2 x 200 MVA 330/220/33 kV tie transformers. In order to prevent overloading of an in-service 330/220/33 kV transformer at Darlington Point Substation following an outage of the other, the pre-contingent loading is capped at 125 MVA per transformer for ambient temperatures of 45 degrees Celsius.[36]

Since the 2 transformers provide supply to Line X5, it is not necessarily required to have N-1 capability at the substation, as following an outage of Line X5 renewable generation in the

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35 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, clause 5.2 (c).

36 Transgrid, *Options Evaluation Report, Darlington Point 220 kV Transfer Tripping Scheme*, 9 November 2021, p.2.

area is heavily curtailed. Therefore, the transformers can be treated as 1, such that when 1 trips off and the total flow is above the current 125 MVA limit per transformer, then the other transformer can also be tripped off, by opening the 220 kV circuit breaker of the remaining in-service transformer to prevent its overload.[37]

This arrangement at a cost of $0.37 million will facilitate an increase in the power flow on the transformers to be permitted under normal conditions, up to the capacity allowed on Line X5, and prevent overload on the remaining in-service transformer under loss of 1 of the transformers.[38]

Priority Project 3: N2575 - Relieve X5 Voltage Stability Constraints

We accept this project because it is likely to deliver a material benefit to consumers as required by the STPIS.[39]

Currently, there is a constraint in AEMO's National Electricity Market Dispatch Engine (NEMDE) to limit power flow on Balranald to Darlington Point line X5 to ensure voltage stability at Balranald substation should a contingency event happen in north-west Victoria. This voltage stability constraint significantly limits renewable generation at Balranald, Broken Hill and north-west Victoria.[40]

Voltage stability assessments in the area indicate that in order to maintain the voltage at Balranald above the required level of 0.9 per unit while considering the possible credible contingency events, power flow on line X5 needs to be limited to about 150 to 200 MW depending on system conditions.[41]

Relieving this voltage stability limit at a cost of $5.6 million on line X5 is expected to provide market benefits by allowing additional renewable generation into the market and avoid the need for higher cost generation to be dispatched.[42]

The assessments indicate that reactive power injection, such as capacitors at Balranald substation, can relieve the limit on line X5 between 5 to 10 MW, depending on generation dispatch at Balranald, Broken Hill and power import from Victoria.[43]

Priority Project 4: N2470 - Increase Capacity of 94T – DLR

We accept this project because it is likely to deliver a material benefit to consumers as required by the NCC.[44]

This project involves implementing a Dynamic Line Rating (DLR) system on the 132kV transmission line 94T (Molong to Orange North) to optimise its thermal capacity depending

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37 Transgrid, *Options Evaluation Report, Darlington Point 220 kV Transfer Tripping Scheme*, 9 November 2021, p.2.

38 Transgrid, *Options Evaluation Report, Darlington Point 220 kV Transfer Tripping Scheme*, 9 November 2021, p.2.

39 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, clause 5.2 (c).

40 Transgrid, *Options Evaluation Report, Relieve X5 Voltage Stability Constraints*, 10 November 2021, p.2.

41 Transgrid, *Options Evaluation Report, Relieve X5 Voltage Stability Constraints*, 10 November 2021, p.2.

42 Transgrid, *Options Evaluation Report, Relieve X5 Voltage Stability Constraints*, 10 November 2021, p.2.

43 Transgrid, *Options Evaluation Report, Relieve X5 Voltage Stability Constraints*, 10 November 2021, p.2.

44 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, clause 5.2 (c).

on the prevailing weather conditions. Hence, this will improve the transfer capability of this line in order to reduce the emerging constraints on low-cost renewable generation in the Central West area.[45]

Due to the combined effect of the solar farms in the Central West 132kV subsystem and growing demand in Orange area, very high flows are expected through the Line 94T at times of high renewable generation in the network west of Molong.[46]

We accept Transgrid's calculation of benefits prior to the Need 2162 augmentation. The average benefit calculated is about $0.5 million per year which, as an annualised capex amount of about $5.0 million, is significantly greater than the capital cost $0.47 million. Even if a more conservative view was to be taken of the benefits, the project would deliver net benefits to consumers prior to the Need 2162 augmentation and will continue to deliver benefits after the augmentation. This may also support a deferment of the augmentation.[47]

Priority Project 5: N2471 - Increase Capacity of Yass Transformers

We do not accept this project because it is unlikely to deliver a material benefit to consumers as required by the STPIS.[48]

This project involves the implementation of a dynamic rating system with a capex cost of $1.5 million for the Yass No.1 and No.2 330/132 kV transformers to potentially reduce the constraints on low-cost renewable generation in the Southern area by increasing the transfer capability of these units under contingency conditions.[49]

Implementation of this work allows the optimisation of loading levels of the Yass No.1 and No.2 transformers and delivers economic (market) benefits from the provision of up to an additional 50MW of capacity from each transformer under N-1 conditions.[50]

This project appears to be uneconomic and has overstated the utilisation capacity.

- The maximum benefit that can be obtained from this work (as compared to the base) under N-1 conditions (i.e., the loss of 1 of the transformers) is 50MW.
- There are 2 situations considered:
  - unplanned outage due to the total loss of 1 of the transformers requiring an outage of 30 days but with a (conservative) probability of 1 in 10 years; and
  - planned outage of each transformer for 1 day each per year
- Unplanned outage:
  - Maximum additional capacity compared to base case: 50MW
  - Utilisation of additional capacity (noting that the majority of the load is solar generation): 7 hours per day for 30 days

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45 Transgrid, *Options Evaluation Report, Increase Capacity of 94T - DLR*, 11 October 2021, p.2.

46 Transgrid, *Options Evaluation Report, Increase Capacity of 94T - DLR*, 11 October 2021, p.2.

47 Transgrid, *Options Evaluation Report, Increase Capacity of 94T - DLR*, 11 October 2021, p.2.

48 AER, *Final – Service Target Performance Incentive Scheme*, October 2015, clause 5.2 (c).

49 Transgrid, *Options Evaluation Report, Increase Capacity in Yass Transformers*, 28 September 2021, p.2.

50 Transgrid, *Options Evaluation Report, Increase Capacity in Yass Transformers*, 28 September 2021, p.2.

  - Value: $32.05/MWh
  - Probability of occurrence: 1 in 10 years
  - Total Annual Value: $33.7k
- Planned Outage
  - Maximum additional capacity compared to base case: 50MW
  - Utilisation of additional capacity (noting that the majority of the load is solar generation): 7 hours per day for 1 day for each transformer
  - Value: $32.05/MWh
  - Probability of occurrence: each year
  - Total Annual Value: $22.4k
- Total Annual Value: $56.1k.

Based on a life of 22 years and a WACC of 4.8%, this equates to a maximum capital spend of $604k, below the proposed capex of $1.5 million.

Priority Project 6: N2655 - Maintain capacity during Climate Change

We accept this project because it is likely to deliver a material benefit to consumers as required by the STPIS.[51]

There is an opportunity to improve the utilisation of Transgrid's transmission lines using DLRs.[52]

In order to optimise the loading level of a given transmission line, DLR weather monitoring systems have been developed and installed on a number of transmission lines that are approaching loading limits under normal conditions and/or where ratings may become a local network constraint under contingency conditions. The use of real-time localised data can obviate the need for applying conservative maximum line rating estimates which are based on assumptions and safety factors as opposed to actual loading and weather conditions, thereby releasing additional network capacity.[53]

This option will require installation (at a cost of $5.9 million) of weather station elements connected back to a central processing unit (HMI) via a suitable mobile network (e.g., Telstra) to enable Transgrid to apply DLR to a selection of 11 constrained lines.[54]

[51] AER, Final – Service Target Performance Incentive Scheme, October 2015, clause 5.2 (c).

[52] Transgrid, Options Evaluation Report, Maintain capacity during Climate Change,9 November 2021, p.2.

[53] Transgrid, *Options Evaluation Report, Maintain capacity during Climate Change*, 9 November 2021, p.2.

[54] Transgrid, *Options Evaluation Report, Maintain capacity during Climate Change*, 9 November 2021, p.2.

Glossary

Term	Definition
Capex	Capital expenditure
CCP25	Consumer Challenge Panel, sub-panel 25
CESS	Capital expenditure sharing scheme
DI	Dispatch interval
DLR	Dynamic Line Ratings
EBSS	Efficiency benefit sharing scheme
F&A	Framework and approach
LoS	Loss of Supply
MAR	Maximum allowed revenue
MIC	Market impact component
NCC	Network capability component
NCIPAP	Network capability incentive parameter action plan
NEMDE	National Electricity Market Dispatch Engine
NEO	National Electricity Objective
NER	National Electricity Rules
Opex	Operating expenditure
RIN	Regulatory information notice
SC	Service component
STPIS	Service target performance incentive scheme
TNSP	Transmission network service provider
WACC	Weighted average cost of capital